



## Focus on Metal Finishing and Electroplating

It's hardly news that metal finishing and electroplating companies face significant environmental challenges in managing toxic materials and hazardous wastes. Older, established manufacturing and treatment technologies produce large volumes of waste water and, at times, release significant quantities of hazardous waste into the environment. Treating or disposing of these wastes in accordance with federal and state requirements is a costly proposition.

So why generate so much waste in the first place? This issue of **TECHNOVATION** will show you how your business can save money, eliminate waste, and protect the environment. You'll read about recycling and reusing chemicals and about various technologies that use self-contained or "closed-loop" waste water management systems.

Information about these pollution prevention and cost savings

technologies is brought to you by two EPA Region I-New England groups, the New England Environmental Assistance Team (NEEAT) and the Center for Environmental Industry and Technology (CEIT). Read on for more information about:

- The use of polymers that selectively bind with metal ions in rinse baths so that the metals can be effectively and economically recovered using ultrafiltration technology
- An electro-coalescence technology which injects oxygen and nitrogen ions into waste water to stimulate coagulation, allowing suspended and dissolved contaminants to be easily filtered out of waste water
- A diffusion dialysis technology which can concentrate a used weak acid up to 95% of its original strength for reuse in plating baths or other wet processes
- A new degreasing system using less hazardous hexafluoroethane (HFE) and solvating agents designed to replace older, chlorofluorocarbon (CFC) systems
- An EPA/DOE project focusing on zero discharge technology

If you are interested in obtaining further information about EPA regulations and pollution prevention programs, contact the NEEAT

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## About CEIT



Achievement of environmental goals requires more than a continued reliance on existing technologies. In today's competitive business environment, companies must seek out new ways to effectively and economically reduce and prevent pollution. Innovative technologies offer the promise that expanded and continued economic growth can be reconciled with strong environmental protection.

Recognizing that New England has a rich supply of innovative ideas and technologies that would benefit both the environment and the economy — if they could find their way to the marketplace — EPA Region I-New England established the Center for Environmental Industry and Technology (CEIT).

This center, developed in coordination with representatives from industry, is promoting New England's environmental technologies and the region's \$10 billion environmental industry by:

- Improving the ability of the industry to gain access to state and federal programs

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## Fax-Back Service Up and Running

Need some written guidance on Resource Conservation and Recovery Act (RCRA) regulations? Try the new fax-back service system which enables users to receive selected materials by calling in from their fax machines. Once a document is selected the system automatically sends the information to the requestor's fax machine. Copies of instructions can be obtained through the RCRA/Superfund Hotline at (800) 424-9346 or (703) 412-9810.

# Metal Finishing and Electroplating Technology Showcase\*

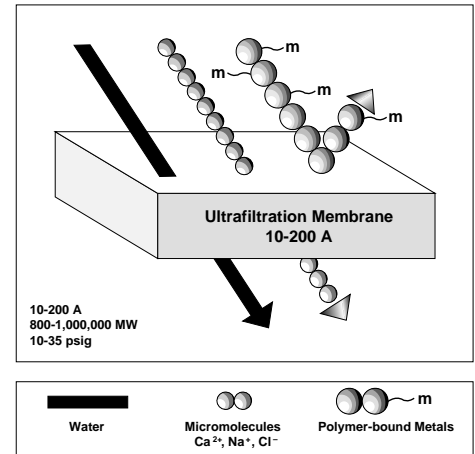
## Micro-Set

Micro-Set is the industrial partner of the Los Alamos National Laboratory in charge of commercializing the Polymer Filtration Systems technology. This technology has the proven capability to selectively recover metal ions from waste water and regenerate valuable resources: water may be returned to the rinse bath, metal ions may be returned to the plating bath, and the polymers may be reused within the system. The combination of these traits creates the potential for a completely closed-loop process.

This low-cost, low-energy, polymer filtration technology incorporates advanced metal ion recovery techniques (employing water-soluble, metal-binding polymers) in combination with ultrafiltration to selectively capture valuable metal ions for direct reuse or recovery.

Once the polymer is allowed to rapidly bind to the metal contaminants at neutral pH, the resulting complex's molecular weight is too large to allow it to pass through an ultrafiltration membrane. After all of the contaminants are captured and the solution is concentrated to 100 to 1, the metals can be selectively recovered through stepped decreases in the pH level. Other potential applications include processing waste streams from industrial waste waters and mining operations, eliminating trace impurities from municipal waste water, and removing toxic metals from drinking water. This technology is potentially applicable to every field requiring advanced metal recovery techniques at well below government mandated discharge limits.

This technology has been demonstrated on a bench scale, at a Boeing



*Polymer-bound heavy metals are filtered out of electroplating bath*

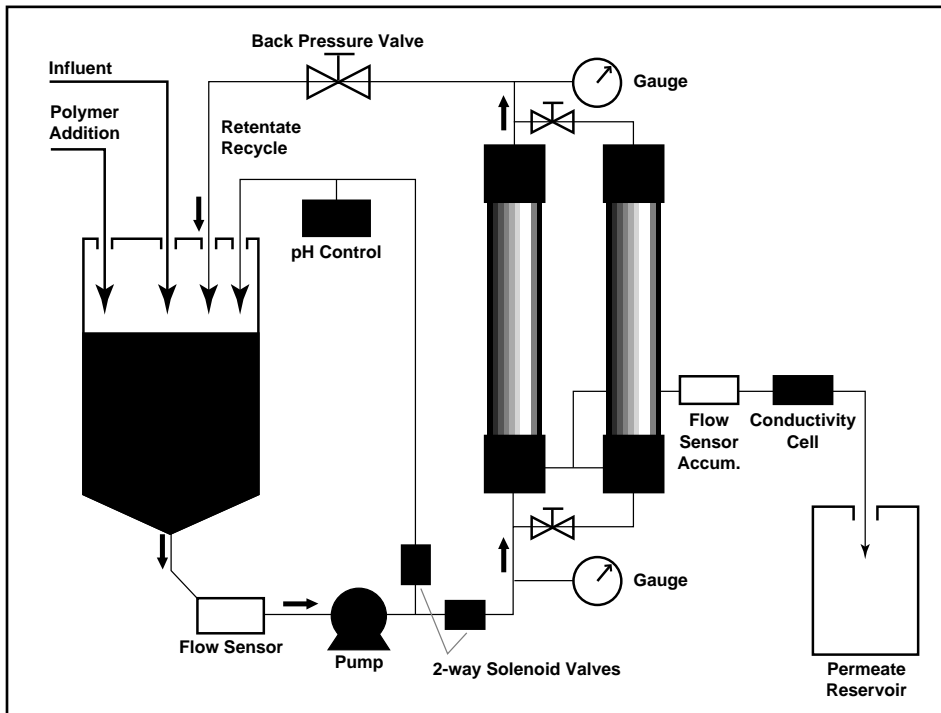
Aircraft electroplating facility, and at a commercial electroplating job shop. No adverse effects were observed in plating quality tests of baths before and after the process. Tests of the residual level of contaminants in the permeate waters yielded levels of less than 0.01 ppm and the treated water met POTW discharge limits.

## Highlights

- Low energy and capital costs
- Potential to operate as a closed loop system
- High capacity and selectivity
- No sludge formation
- Resulting water meets or exceeds metal discharge limits

For further information on the Polymer Filtration System contact:

Kirk Dohne or Mike Lima  
Micro-Set  
703/360-5789



*Schematic of polymer filtration process*

\*Disclaimer — Mention of any commercial product or process does not constitute endorsement by the U.S. Environmental Protection Agency

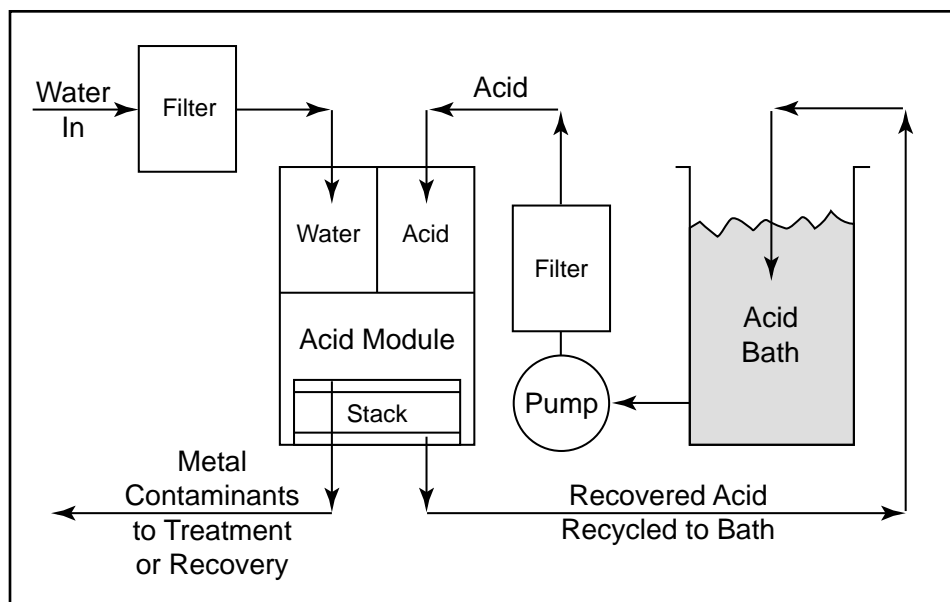
## AquaMetrics Industries

AquaMetrics Industries's patent pending Electro-Coalescing Technology (trade name AquaTronic) extracts suspended and dissolved contaminants from industrial waste water, without the use of hazardous chemicals. This waste water recycling and reclamation system converts air and ozone into positively and negatively charged oxygen and nitrogen ions which are continuously injected into waste water. The ions serve as catalysts for contaminants to coagulate into large, easily filtered clusters. Polarized cellulose fibers also are added to the waste water to enhance ion attraction and accelerate coagulation and subsequent particle removal. The system is closed-loop, using and recycling 100% of the original process water for several months.

The AquaTronic Technology is designed around several components. A company can design a tailored recycling and reclamation system by using all of the components or "mixing and matching" components to meet the company's individual needs.

The AquaTronic Technology has been tested in several applications. At the Darlene Jewelry Corp., in Pawtucket, Rhode Island, the technology was used to recycle/treat waste water from finishing and electroplating. This company finishes copper, zinc, lead, cadmium, nickel, and antimony products and electroplates them with copper, nickel, gold, and silver.

Before installing AquaTronics, the facility's total daily discharges included 25,000 gallons of plating rinses, 10,000 gallons from cleaning lines and noncontact water, and 1,000 gallons of mass finishing concentrate. Closed-loop recycling systems were installed on all of the plating rinses in 1992. Approximately 1,750,000 gallons of water/



*Schematic of Pure Cycle's Acid Recycling System*

year were saved on the nickel running rinses, while 3,000,000 gallons of water/year were saved on the copper, gold, and silver cyanide running rinses. Finally, Darlene installed a closed-loop recycling system on the mass finishing process, which resulted in zero discharges and reduced water consumption by 250,000 gallons/year. In addition, the concentrated solids were sold to a smelter for recycling into soap.

### Highlights

- Significant reduction of water consumption
- Elimination or reduction of chemical and soap consumption
- Elimination or reduction of hazardous sludge (D008) disposal
- Reduction in utility bills and disposal costs — results in overall cost savings

For further information on AquaTronics contact:

Howard E. Schachter  
President, AquaMetrics Industries  
401/943-8444

## Pure Cycle Environmental Technologies, Inc.

Pure Cycle has developed a membrane separation technology, which uses the principles of diffusion dialysis, to recover and reconcentrate acids from used electroplating baths. The Pure Cycle Acid Recycling System technology (patent pending) was specifically designed for the metal finishing industry. Diffusion dialysis recovers nitric, hydrochloric, hydrofluoric, fluoboric, and sulfuric acid from plating baths and returns the acids to the plating or other wet process for reuse.

Ion exchange membranes are sandwiched between spacers to form a series of cells. Used acid is circulated through the system, at a very low flow rate, so that the acid contacts one side of the anionic ion exchange membranes. Water is circulated through the system counter-current to the acid. Most of the acid migrates through the membranes into the water, while contaminants (e.g., heavy metals) are trapped behind with a small amount of spent acid. The purified acid is

directed back into the process tank. The contaminated spent acid stream is sent to either a metal recovery system or a waste water treatment system.

Pilot testing has shown that Pure Cycle's Acid Recycling System can recover and concentrate used acids to up to 95% of their original strength. The system can handle a wide variety of mineral acids at high concentrations; this allows the reclaimed acids to be reused indefinitely.

### Highlights

- Minimizes waste generation and reduces raw material consumption — reduces waste treatment requirements and results in up to 95% reduction in new acid purchases
- Helps companies avoid off-site disposal, reducing long-term liability
- Decreases material handling and labor
- Easily adapts to most commonly used acid pickles and strips

For further information on Pure Cycle's Acid Recycling System contact:

Daniel E. Bailey  
President, Pure Cycle Environmental Technologies, Inc.  
413/283-8939

## Greco Brothers Incorporated

Greco Brothers, Inc. has designed a new line of parts and/or materials cleaning equipment which uses the Advanced Vapor Degreasing (AVD) process developed by Petroferm, Inc. of Fernandina Beach, Florida. The Greco Brothers AVD equipment can replace older cleaning systems, which use ozone-depleting chlorofluorocarbons (CFCs), with a two-step cleaning process that uses

environmentally-friendly hexafluoroethane (HFE) and solvating agents.

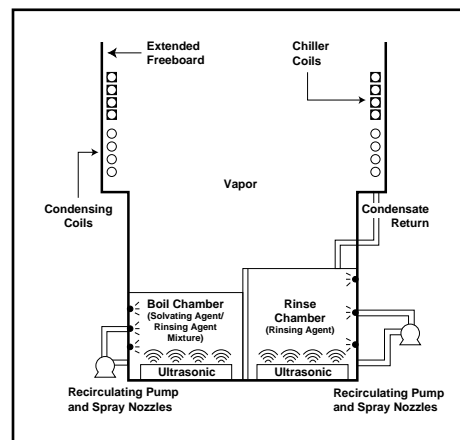
Materials or parts to be cleaned are lowered into a boil chamber containing continuously-heated solvating and rinsing agents. The solvating/rinse agent mixture is agitated by spraying and/or ultrasonics to dissolve and remove contaminants from the parts. The cleaned parts are then immersed in a separate rinse chamber where ultrasonics and spraying activate the rinse agent. This step removes any residual solvating agent, dissolved contaminants, or residual particles. The cleaned parts are then removed from the rinse chamber and held in a vapor zone for a condensation rinse.

### Highlights

- Provides 150% freeboard to prevent overflow
- Provides continuous filtration
- Reduces vapor emissions through sealing
- Adapts easily to many different product specifications

For further information on Greco Brothers' AVD system contact:

Ralph Greco, Jr.  
President, Greco Brothers, Inc.  
401/421-9306



*Greco Brothers, Inc. two-step Advanced Vapor Degreasing System*

### Focus on, Continued from page 1

hotline at (800) 90-NEEAT. If you are interested in showcasing your innovative technology in upcoming issues of TECHNOVATION, please contact CEIT at (800) 575-CEIT.

## About CEIT

*Continued from page 1*

- Increasing access to technology demonstration sites and testing evaluation
- Increasing access to capital
- Reducing regulatory and institutional barriers facing the environmental industry
- Marketing environmental products and innovative technologies both here and abroad.

For more information contact the CEIT at 800/575-CEIT, or write to:

Jim Cabot or Carol Kilbride  
EPA Region I-New England  
JFK Federal Building (SPI)  
Boston, MA 02203-0001

## What is an Innovative Technology?

An innovative technology is a newly introduced, yet technically feasible, process or application that is not well established by widespread use under a variety of site-specific conditions or for which performance or cost information is incomplete. This includes manufacturing, processes, monitoring, measurement, and remediation technologies.



# EPA and the Department of Energy Working Together: Approaching Zero Discharge in Plating and Metal Finishing

EPA and the Department of Energy's (DOE's) Lawrence Livermore Laboratory (LLL), as well as some industry contributors, have funded a joint project to encourage the development and commercialization of cleaner metal finishing and electroplating processes. Project team members are evaluating technologies that will protect the environment by:

- Using less toxic materials as alternatives to the more toxic metals traditionally used in metal finishing/electroplating
- Conducting demonstrations of technologies that promote waste

reduction by approaching zero discharge through improved operating practices and/or recycling and reclamation processes

EPA and LLL will select three or four technologies for demonstration. Baseline and test data collected during demonstration will include environmental emissions, maintenance, production throughput and product quality, energy consumption, capital and operating costs, and occupational exposure. Each technology will be measured for success in pollutant reduction and cost effectiveness. It is expected that the

demonstrations will be conducted in 1997.

The research needs of the project will be supported by the Research and Technology Workgroup of EPA's Metal Finishing Common Sense Initiative.

For more information on this project contact:

Jack Dini  
Lawrence Livermore Laboratory  
510/422-8342  
*or*  
Paul Randall  
U.S. EPA  
513/569-7673

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## The Massachusetts Toxics Use Reduction Institute Evaluates Closed Loop Aqueous Cleaning

The Toxics Use Reduction Institute (TURI) at University of Massachusetts-Lowell examined the use of closed loop aqueous cleaning systems in metal finishing and electronic parts cleaning. The purpose of the September 1995 study was to determine the effectiveness and use of these systems and to introduce these systems to potential users. TURI found that, to comply with current regulations, many companies in Massachusetts are replacing older systems using chlorinated solvents with aqueous cleaning systems. To date, however, few companies have installed closed loop systems.

Closed loop aqueous cleaning was determined to be a proven technol-

ogy that can reduce waste volumes by both concentrating sludge and extending the life of the cleaning bath between seven and ten times. This technology also allows a company to reduce chemical purchase and consumption, as well as reducing water consumption.

TURI is a multi-disciplinary research, education, and policy center. The Institute seeks to reduce the use of toxic chemicals and the generation of toxic chemical by-products. TURI sponsors at least three programs of specific interest to the metal finishing and electroplating industry sector.

- The Technology Transfer Center has collected technical articles,

reports, and other references on toxics use reduction and pollution prevention

- The Surface Cleaning Laboratory provides assistance in testing and evaluation of aqueous cleaners
- TURIS's World Wide Web site [<http://www.uml.edu/turi>] and P2 GEMs, which is an internet search tool for facility planners, engineers, and managers seeking technical and process information on toxics use reduction and pollution prevention

For further information on TURI call 508/934-3275.

## For Further Technical Assistance and/or Financial Assistance Contact the Following

### EPA Region I-New England

New England Environmental  
Assistance Team Hotline  
1-800-90-NEEAT  
9:00 a.m. to 4:00 p.m. (EST)  
Monday - Friday

Office of Technical Assistance  
Rick Reibstein, 617/727-3260 x688

Toxics Use Reduction Institute  
Janet Clark, 508/934-3346

### Connecticut:

The Connecticut Technical Assistance  
Program (ConnTAP)  
Robert Brown, 860/241-0777

### New Hampshire:

NH Pollution Prevention Program  
Vince Perilli, 603/271-2902

NH Pollution Prevention Partnership  
Student Internship Program  
Dr. Ihab Farag, 603/862-2313

### Maine:

Department of Environmental  
Protection (DEP)  
Office of Pollution Prevention  
Ann Pistell, 207/287-7881

### Rhode Island:

DEM Pollution Prevention Program  
Tristyne Jones, 401/277-3434 x4413

### Massachusetts:

Industrial Services Program  
Fara Courtney, 617/727-8158

### Vermont:

Agency of Natural Resources  
Environmental Assistance Division  
Gary Gulka, 802/241-3626

## Upcoming Events

### October 1, 1996 - Annual Meeting of the Electroplaters and Surface Finishers (AESF)

The Merrimac New Hampshire Chapter of the AESF, will hold its annual meeting on Tuesday, October 1, 1996 at the Sheraton Portsmouth Conference Center, Portsmouth, NH. The meeting, open to all interested parties, will be held from 8:30 a.m. - 4:00 p.m., and will include workshops on new environmental regulations, recycling technology, and energy audits. For more information contact Ms. Karina Drumheller at 603/863-4344.

### October 1996 - 22nd Annual "Mr. Clean" Conference

On October 16, 17, and 18, 1996 the Massachusetts Toxics Use Reduction Act Program will host the 22nd Mr. Clean Conference on Cleaning and Contamination Control featuring presentations by nationally-recognized experts in surface cleaning. For information, please contact Liz Harriman at the Toxics Use Reduction Institute at 508/934-3275.



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